

Project Title:

Inquiry and Science Induction for Schools (ISCIS)

Description of project goals and major activities:

COSI Toledo (a science center), the Toledo Public Schools, and the Lucas County Schools propose a new model to bolster the experience, confidence, and expertise of new elementary school teachers. The project combines a nationally recognized teacher induction program with the teaching resources of a science center to provide new teachers with thorough and sustained professional development designed to promote state-of-the-art science education.. The ISCIS project will serve as a national model for museums to help retain and support novice teachers in the nation's public schools.

Novice teachers face many challenges in their first few years of teaching, among them managing the classroom, implementing curricula, and meeting state education standards. For new elementary teachers, attrition rates are climbing as are the numbers of teachers who feel ill-prepared to teach science. In order to retain and support these teachers, the American Federation of Teachers calls for strong mentoring-based induction programs. The ISCIS project infuses an extant induction program with new mentoring strategies and solid science, with an emphasis on new state science standards and up-to-date science content. The components of the project include: content-based and science-inquiry workshops, a novice teacher support group, and eight day summer institutes. Forty novice elementary teachers and ten mentor teachers will participate in these professional development programs over a two-year period.

The ISCIS project will affect elementary teachers through:

- offering effective and sustained professional development for K-6 novice and veteran (mentor) teachers in inquiry-based science;
- establishing a support network for novice teachers by way of partnering with mentor teachers;
- supporting elementary science reform efforts by creating a fellowship among science education professionals; and
- developing a model of collaborative professional development, founded on the epistemology of scientific inquiry, for other universities, informal science institutions and school districts across the nation.

Anticipated results:

Through the ISCIS project, teachers will build upon the teaching and learning theories they were exposed to in college, gain confidence and proficiency in teaching science, use inquiry-based teaching methods and resources, and increase their satisfaction with and desire to continue teaching.

1. National Impact

Public schools are struggling to retain new teachers. "The attrition rate for beginning teachers (those with 3 to 5 years of experience) hovers at 20% to 30%, and can be as high as 50% in urban districts" (American Federation of Teachers, 2001). In fact, since 1990 the number of teachers leaving the teaching profession has surpassed increasingly the number of teachers entering the profession (Darling-Hammond, 2003). The reasons for this include teacher salaries, working conditions, teacher preparation, and mentoring support in the early years.

New teacher attrition hampers schools dramatically. A recent study in Texas revealed that it costs the state \$329 million a year for the teachers who leave in the first few years of teaching (Texas Center for Educational Research, 2000). The quality of teaching is also affected. There is evidence that, "...beginning teachers rapidly shift from progressive, student-centered attitudes formed during pre-service to traditional, teachers-centered approaches when confronted with the realities of the workplace" (Appleton, 2002). Supporting new teachers is critical to raising the quality and reducing cost of education in America's public schools.

To address these concerns the American Federation of Teachers (AFT) passed a resolution, which called for all novice teachers to participate in induction programs to develop and perfect their teaching skills under the mentorship of more experienced colleagues (AFT, 2001). Effective induction programs include mentoring from master teachers and curriculum support. Yet, the quality of and available funding for these programs is inconsistent. The AFT found that 33 states have induction policies, but only 22 mandate and fund these programs. Furthermore, many induction programs struggle to build confidence and excellence in science education.

Science museums are uniquely situated to help induction programs implement required science curricula, particularly in inquiry-based science instruction. "... roughly 75% of elementary teachers feel very well qualified to teach reading/language arts ... (but) only about 25% feel very well qualified to teach science" (National Survey of Science and Mathematics Education, 2000). Novice teachers' science-teaching practices are influenced by their own experiences as students during science lessons at school and college. Since many elementary teacher education students have had limited success in their own science learning, there are consequent effects on their confidence in teaching science (Appleton, 2002). In a society where knowing and understanding science and technology is important to future employment, health decisions, and consumer choices, it is imperative that teachers become comfortable with science so that their students can become engaged in science.

To ensure a scientifically literate public, the National Science Education Standards (NSES) were introduced in 1996. The NSES shifted the focus from science-content acquisition to scientific inquiry, which required a substantive change in the ways many teachers currently teach science. In classrooms that utilize inquiry-based teaching methods, teachers are facilitators posing valuable questions that lead to deeper understanding about science skills and concepts while utilizing on-going assessment throughout the inquiry process. Though national science standards (American Association for the Advancement of Science [AAAS], 1989; Science & Mathematics Network [SMN], 2003) state that inquiry-based teaching methods should be the primary way in which science is taught, fostering the use of these methods has been a challenge for science teacher-educators (Loucks-Horsley, 1998).

The science museum community has become a resource for teachers in practical experiences of teaching science. According to an article from *Education Week*, "...informal science institutions today are aggressively positioning themselves as significant support systems to K-12 schools: through the creation of professional-development programs for teachers, by working directly with students, and by developing new learning resources and technology tools to connect the outside world to schools" (Bartels, 2001). A survey conducted on behalf of the Association of Science & Technology Centers (ASTC) found that 18% of all teachers who engaged in science in-services participated at Informal Science Education institutions and that science centers tend to offer more forms of support than other types of institutions (ASTC, 1996). This positions science centers as notable resources for schools in supporting novice teachers.

Although science museums and other informal science education institutions (i.e. zoos, botanical gardens, aquaria) are becoming part of a strong infrastructure for ongoing teacher professional development in science, there is no model for coordinating with novice year induction programs. With an increasing number of states instituting induction year programs, the discomfort with science that many incoming teachers have and the introduction of new science standards in state curriculums, there is a need to develop a model for cooperation with induction year programs.

COSI Toledo, Toledo Public Schools, Lucas County Schools, and the University of Toledo are partnering to develop a model for an induction year program that emphasizes science inquiry. COSI Toledo proposes in this application a model that will bring together a nationally recognized induction year program and innovative science inquiry-based workshops and exhibits at a time when the local schools are experiencing a science reform effort. Outcomes resulting from this program include a model for museums to support district induction year programs, workshops and curriculum geared to novice teachers, and a support system for new teachers.

2. Adaptability

This project will serve as a model for a collaborative program that addresses issues of novice elementary teachers. While many models exist for ongoing relationships with school districts and museums providing teacher professional development, none specifically address the needs of elementary novice teachers in science inquiry.

The proposed project, **Inquiry and Science Induction for Schools (ISCIS)**, will unite the resources of public schools, universities and a science museum to develop a cohesive, comprehensive induction year program that will assist K-6 teachers in their first and second years of teaching to gain new skills and adopt behaviors that support and improve science teaching. In addition to the initial challenges (discipline, motivation, preparation), first year teachers must also face new state standards and teaching subjects for which they have received inadequate preparation. When overwhelmed with all these demands, new teachers can become isolated and discouraged, resulting in a "sink or swim" scenario. The **ISCIS** project will respond to this by supporting teachers through a new teacher support group, a science mentor teacher, and ongoing science institutes/workshops. This model can be integrated into an existing induction year program or serve as an example to school districts for induction year programming. By empowering new teachers to engage in the process of **science inquiry early in their careers**, this model will lead to a more confident **science teacher** resulting in students eager and interested in the science transpiring in the world around them.

3. Design

Needs Assessment

Research was conducted to assess the teacher professional development needs in the state of Ohio and some compelling trends were discerned. The Ohio Collaborative, a research and policy analysis group, reported to the Ohio Department of Education in 2002 that:

- The percentage of teachers with 10 or fewer years of experience has increased from approximately 37% to about 50% since 1997;
- Teachers with 5 or fewer years of experience accounted for just over 1 in 5 teachers in 1997. Now these least experienced teachers account for 1 in 3;
- High poverty urban districts show the highest mobility rates. Teachers in these districts are more likely to leave teaching than move to other districts in Ohio.
- Special programs and policies will continue to be needed for specific teaching areas (both science and math) where shortages are likely to continue.

Further need arises after the adoption of new Ohio Science Content Standards (2003), an initiative of many state education agencies throughout the nation, in order to better align with the National Science Education Standards and adhere to mandates set forth by the No Child Left Behind Act. With this shift in science curriculum, teachers are scrambling for ways in which to increase their content knowledge and adapt their instruction to meet the demands of this new framework. Recommendations from the Legislative Office of Education Oversight stated that, "...both veteran and beginning teachers are going to require extensive professional development to understand and incorporate into their instruction the new academic standards and student assessments" (Legislative Office of Education Oversight, 2001).

The local need in the Toledo area reflects the aforementioned research. The partnering school districts are located in high-poverty, urban areas, with high teacher turnover. Craig Cotner, Toledo Public Schools (TPS) Assistant Superintendent and Chief Academic Officer, outlined some of the district's needs this project could fulfill. They include:

- Helping all teachers understand and integrate new state science standards;
- Providing all teachers with practical experiences in science inquiry;
- Encouraging professional development in science for novice teachers and;
- Supporting the TPS systemic science reform effort, which started in 1998.

The ISCIS project anticipates these needs through several integrated components resulting in a two-year program for mentor and novice teachers. The National Research Council publication, *Inquiry and the National Science Standards* (2000) outlines attributes of successful professional development, which include: coherent opportunities for teachers to learn over time; a collaboration of people and organizations; and a clear commitment to the National Science Education Standards. The multiple session format of the ISCIS project is an ongoing, sustained program for teachers, providing ample opportunities to plan, implement, refine and embrace an inquiry-based teaching approach. As a result, the ISCIS project will:

Goals	Outcomes
1. Offer effective and sustained professional development for K-6 novice and veteran (mentor) teachers in inquiry-based science.	<ul style="list-style-type: none"> a. Increased utilization of inquiry-based teaching methods and resources in K-6 classrooms. b. Increased teacher comfort level in teaching science. c. Acquisition of new pedagogical skills and content knowledge. d. Increased understanding and improved skills in aligning classroom lessons with state/national science content standards.
2. Establish a support network for novice teachers through partnering with mentor teachers.	<ul style="list-style-type: none"> a. Novice teachers will explore and define their beliefs regarding science teaching and learning. b. Novice teachers will adopt effective classroom practices. c. Decrease the isolation that novice teachers encounter in their first years of teaching.
3. Support elementary science reform efforts by creating a fellowship among science education professionals (teachers, administrators, teacher educators and informal learning educators).	<ul style="list-style-type: none"> a. Adoption of new teaching behaviors and strategies that promote student understanding of scientific inquiry. b. Engagement in best-practice sharing that allows for teachers to design curriculum implementation strategies and enhance classroom practices. c. Development of classroom activities and explorations that promote student practice of scientific inquiry and positive attitudes toward science.
4. Develop a model of collaborative professional development, founded on the epistemology of scientific inquiry, for other universities, informal science institutions and school districts across the nation.	<ul style="list-style-type: none"> a. Presentation of program implementation and evaluation results at local, state and national education forums.

The Partners

COSI Toledo is a science center that has welcomed more than 2 million visitors, including nearly 1 million students and teachers, since opening in 1997. Collaborations such as *Horizons*, a partnership that delivers science curriculum to TPS gifted and talented students, and the *Inquiry Partnership Program*, a year long professional development series for elementary TPS teachers in inquiry learning, make COSI a regional resource for science inquiry. This is based on a partnership with the Exploratorium, bringing in nationally acclaimed inquiry exhibits and extensive training through 2005. The training focuses on teacher professional development through the Exploratorium's Institute for Inquiry, Center for Informal Learning in Schools and ExNET (Exploratorium Network for Exhibit Based Training). COSI has successfully established a teacher professional development program (COSI

Institute) since 1999 and has reached over 500 K-8 educators. The focus of the COSI Institute is on empowering educators to become facilitators for learning, a vital component of inquiry-based science instruction, and is the foundation for COSI's role in the ISCIS project.

Toledo Public Schools (TPS) is the fourth largest public school system in the state of Ohio and has about 37,000 students. TPS has been part of a systemic reform effort in science called *TAPESTRIES*, (Toledo Area Partnership in Education: Support Teachers as Resources to Improve Elementary Science). With funding from NSF, it entailed a 5-year initiative among UT and BGSU to develop comprehensive school science program through the professional development of K-6 teachers. TPS achieved national recognition for its Intern-Intervention Program, The Toledo Plan. It was the 2001 winner of the "Innovations in American Government Award" competition co-sponsored by the John F. Kennedy School of Government at Harvard University and the Council for Excellence in Government. The Toledo Plan, which started in 1981, provides a formula for professional development of novice teachers, focusing on mentoring and peer evaluation. The success of the TPS Intern Program offers experience to the ISCIS Project by providing help in development and facilitation of activities.

Lucas County Educational Service Center (LCESC) is one of the largest county offices in the State of Ohio having nearly 400 employees, serving students in nine local and city school districts in Lucas County. The Regional Professional Development Center helps teachers in the county through offerings that focus on standards-based education, a teacher-on-loan program and entry year activities. The *TAPESTRIES* initiative also took place in a Lucas County School district. Board members, staff members, programs, and materials have received local, state and national recognition for outstanding achievement.

The University of Toledo (UT) and Bowling Green State University (BGSU) are both regional universities with strong teacher education programs. Many of the graduates go on to teach in both TPS and Lucas County schools. Both organizations have programs to assist novice teachers. The College of Education at UT has established a New Teacher Help-line in order to increase the likelihood that UT graduates will be successful in teaching and create a professional practices network for teachers. UT and BGSU have led an NSF sponsored local systemic reform effort, *TAPESTRIES*, which has effected the teaching of science in TPS.

Project Description

These program components are designed to collectively integrate content and pedagogy and will allow for time to design, practice, and plan implementation. In classrooms that model inquiry-based teaching methods, students ask questions, design their own procedures for an investigation, make meaning from their findings and communicate the results to others. Teachers take on the role of a facilitator, posing questions that lead students to a deeper understanding of scientific skills and concepts while utilizing on-going assessment throughout the inquiry process. If teachers are to serve as facilitators for learning, they need to experience inquiry for themselves in order to adopt new instructional methods. The ISCIS Project rests on the epistemology of inquiry and affords teachers the opportunity to experience inquiry and develop attitudes and practices in which to integrate the tenets of inquiry within their teaching.

The ISCIS Project aims to through several programmatic components:

- An Orientation Event (Fall 2004) which kicks-off the ISCIS Project, will highlight the main goals and objectives of the program and bring together partners, administrators and teachers.
- Administrator's In-Service (Fall 2004) will be held at the onset of the program to promote collegiality among administration and teaching staff and instill district-wide commitment to the integration of inquiry within science curricula.
- Mentorship Support encompasses several elements which occur once a month throughout the school year and include:
 - a) Mentor-Novice Conferences, which partner one Mentor Teacher (10 total) with three Novice Teachers (30 total), are informal meetings to provide practical examples that initiate the process of moving from guided hands-on lessons to open inquiry.
 - b) Inquiry Touchstones, follow up sessions to the Inquiry Institutes, these 3-hour workshops help teachers hone their skills in inquiry instruction using inquiry exhibits at COSI.
 - c) Support Group Series will be facilitated by ISCIS university partners and serve as a support group for Novice Teachers in challenges with science instruction and classroom practices.
- Summer Inquiry Institutes are 8-day institutes for Mentor Teachers (Summer 2004) and Novice Teachers (Summer 2005). The institutes will create immersive experiences in inquiry. Assessment techniques, classroom applications and strategies to integrate the Ohio Science Content Standards will be addressed. In the second summer, Mentor Teachers will assist in the facilitation of the Novice Teacher Institute.
- Science Content Workshops (1/2 day workshops) for Mentors and Novices will be offered throughout year 2. They will provide teachers with content-based curriculum using inquiry-teaching methods. Opportunities to assess the progress of implementation plans will allow teachers to collaborate and offer content-specific activities to bring into their classrooms.
- Student Field Inquiries (Spring 2005) are field trips to COSI for ISCIS teachers and their students. Teachers have an opportunity to implement methodologies learned throughout the program. Pre and post visit activities are provided to correlate directly to classroom topics.
- Summary Conferences at the end of year one and year two will allow teachers to share their experiences from the project year with their fellow district teachers and administrators through share out sessions, keynote speakers, and awarding certificates for accomplishments.
- Science Teaching Resources will be disseminated on a web-page to ISCIS participants and other interested people.

Similar projects by other museums

The Exploratorium in San Francisco started an induction program for middle and high school teachers in 1998 and they are aware of no other science museum based program. ASTC's survey of professional development programs indicated no specific programs that focus on induction programs for novice teachers.

4. Management Plan

The ISCIS project unites the experiences, content and, the needs of local schools. The success of these past partnerships will serve as models for the collaborative approach to ISCIS.

Partner institutions began planning program design and implementation in January 2004. Monthly assembly of this Planning Committee, comprised of representatives from all project partners, has been initiated and will continue through December 2004. The meeting frequency will then shift to quarterly gatherings for the remaining period of the project (1.5 years) to ensure that all activities maintain the project schedule, budget and objectives as well as provide opportunities to initiate program adjustments according to feedback. This collaborative planning has produced initial project goals and outcomes, designation of lead and support roles for each of the program components (Attachment A), project schedule and identified content to be addressed during each phase of the project.

An Advisory Board (Attachment B), consisting of district superintendents (TPS, LCS), university faculty (UT, BGSU) and museum professionals (Exploratorium and Ft. Worth Museum of Natural History), has been established and will meet twice during the two-year project to confirm the progression of the program. Furthermore, the Planning Committee will maintain communication, via project PI, with the Advisory Board through the project.

Project partners have committed to the goals of ISCIS and will actively participate in the planning and design of all project activities. Each will contribute to the success of the project through dedicated staff, facility usage and other allocations of resources as described below.

COSI Toledo will allocate the time of permanent staff to lead the overall coordination of the project. This includes 50% in year one and two of the Director of Teaching and Learning Resources time; 20% of the Science Specialist's time in year one and year two; 10% of the Director of Education's time in year one and year two and 20% of the Creative Director's time in year two. COSI will commit necessary facility space for the delivery of project components and oversee communications among partner organizations and Advisory Board.

Toledo Public Schools (TPS) will bring curriculum design and instruction expertise, widespread dissemination within formalized education and an at-need audience to this project. TPS has committed 30% of the Science Curriculum Coordinator and time from the Assistant Superintendent and Chief Academic Officer to serve as an Advisory Board member. TPS, providing support via Intern Program resources, will lead project components related to the training of mentor teachers and provide assistance to university partners for the Novice Support Group Series. TPS will consult on curriculum and content for the project and will also provide facility space and resources to facilitate project components.

Lucas County Educational Services Center (LC S) has committed 30% of the Director of Special Projects' time and time from the Superintendent to serve on the Advisory Board. Primary partner responsibilities of LCESC are to assist in the development and facilitation of the mentor training and summary conferences as well as consult on curriculum and content for the project. Additionally, the ISCIS Project Coordinator will be recruited from LCS, a veteran teacher, for the duration of the grant project.

University of Toledo (UT) and Bowling Green State University (BGSU) will share in the development and facilitation of the Support Group Series as well as assist in the delivery of Inquiry Institute curriculum pertaining to assessment, alignment to state/national content standards and classroom practice. UT has committed an Associate Professor of Science Education & Curriculum to serve as Co-PI to assist in leading these partner responsibilities. BGSU will commit an Associate Professor of Teaching & Learning to serve on the Advisory

Board. BGSU Education faculty will fulfill contracted services in the design and facilitation of Summer Inquiry Institutes, Touchstones and Summary Conferences.

Additional Contracted Services includes an evaluation and research firm, (Metriks Amerique, Toledo) to oversee development and implementation of project evaluation, a web/graphic design company (Fowkes Design, Toledo) to develop and maintain web-based resource and dissemination components.

5. Budget

COSI and project partners believe that the program budget is appropriate and sufficient to carry out project activities for the two-year period of the grant. Project partners will share the financial responsibilities, as more clearly defined in the Budget Justification, and have committed funds for project costs including staff time, facilities and other resource allocations necessary for the success of the project.

6. Contributions

Total costs for the ISCIS Project is \$642,648 with a request of \$320,987 from IMLS. COSI and its project partners will provide a 50% cost share totaling \$321,661, demonstrating commitment to achieving the goals and outcomes of the project and ensuring that financial responsibilities are distributed among the partners. In-kind contributions encompass staff salaries, fringe benefits and a percentage of teacher professional development.

7. Personnel

A summary of experiences and skills that each member brings to the project is included below and demonstrates overall commitments of each partner.

Betsy Hood, will serve as Project Director and Principal Investigator. She will oversee all project activities including budget, schedule, evaluation process and lead the Planning Committee. Ms. Hood serves as COSI's Director for Teaching and Learning Resources, overseeing all facets of teacher programming including curriculum development, school district communications and the COSI Institute program. Ms. Hood's degree in Biological Sciences and secondary teacher certification, combined with teaching experience, participation in local and state education groups and nearly 9 years in informal education provide the leadership necessary for the project.

Charles J. Rop, Ph.D. University of Toledo will oversee the development of all content and curriculum for the project and serve as the instructor on record for the graduate coursework associated with project activities. As a former classroom science teacher and currently an associate professor of science education and curriculum, Dr. Rop will lend the needed knowledge and skills of classroom practice to this project.

ISCIS Project Coordinator. This veteran teacher recruited from LCS will work closely with the project director in the development of the project. Main responsibilities of this temporary position include oversight of daily operations including program scheduling, materials/supplies management, Administrator's In-service, Orientation Event and Student Field Inquiries. The Project Coordinator will co-facilitate components of the Inquiry Institutes & Inquiry Touchstones and manage all activities pertaining to science teaching resources.

Samuel B. Dean is a member of COSI's New Experiences Development Team and is responsible for the creation of special events, exhibits, and partnerships. Currently, Mr. Dean is working with the Center for Informal Learning in Schools (an NSF-funded Project) and sits on regional boards regarding technology in education. He will assist in the development and delivery of the Inquiry Institutes, Touchstones and Content Workshops and serve as an active member of the Planning Committee. Coupled with a background in Biology/Geology research, as well as three years in exhibit development and five years in educational program design, Mr. Dean will offer needed support in ISCIS program components.

As COSI's Creative Director, Dante Centuori's responsibilities include leading the creation of new demonstrations and programs, development of team training and researching current events in science to be integrated within all COSI programming. Mr. Centuori joined the COSI team from Walt Disney World he worked on science communication training and development at Epcot. Before that he designed and presented student based programs at three other science centers. He holds a B.S. in Astronomy and Physics. Mr. Centuori will oversee all facets of the Content Workshops as well as provide necessary support for the Summary Conference.

Auntaneshia Garry serves as the Director of Education where she is responsible for all educational programs for the organization. She has designed and implemented curriculum for many science center initiatives including work in teacher professional development. She holds a B.S. in Biology, an M.A. in Counseling Psychology, and is certificated through the Center for Informal Learning and Schools (Exploratorium --San Francisco, CA) on inquiry teaching theory and practice. Ms. Garry's experience will be utilized to assist in the development and facilitation of Inquiry Institutes and Inquiry Touchstones. She will assist with implementation of the evaluation model and will also serve as an active member of the ISCIS Planning Committee.

As TAPESTRIES Coordinator for Toledo Public Schools, Cherie Pilatowski is responsible for overseeing the implementation of this science teaching initiative for the district. A member of Ohio's Model Curriculum Writing Team for Science, she is well versed in the new Ohio Science Standards and their implications on classroom teaching. Ms. Pilatowski's further experience as a Science Support Teacher, mentoring K-6 TPS educators in effective science teaching practices, and her former position as an Intern Consultant for the Toledo Plan (TPS Induction Program), will bring the necessary pedagogical skills to co-coordinate (with LCS) the project's Novice Teacher components. Ms. Pilatowski will manage all aspects of the Mentorship Training components and will assist in facilitating Inquiry Institutes.

Les Schultz is the Director of Special Projects for Lucas County Educational Service Center overseeing educational program for the nine districts served by LCESC. As a former teacher and district superintendent, Mr. Schultz brings nearly 30 years of K-12 educational leadership to the project. Co-coordinating the Novice Teacher components with TPS, Mr. Schultz will oversee the recruitment of Lucas County teachers for the project and curriculum and content to be addressed during the project to ensure alignment to state/national standards.

As a curriculum consultant for the ISCIS project, Dr. Jodi Haney, associate professor for teaching and learning at BGSU will offer the needed expertise to develop and facilitate components for the inquiry institutes (2). Dr. Haney will also consult on design and content of

summary conference, develop and facilitate components of mentor inquiry touchstones and Dr. Rop in the design of graduate credit coursework.

8. Project Evaluation

The Toledo-based firm that designed and implemented the evaluation model for the TAPESTRIES science initiative program previously described in this proposal will perform the evaluation. Progress towards and attainability of the expected outcomes will be evaluated by triangulating three main sources of data – surveys, observations, and focus groups. Existing instruments such as Horizon Classroom Observation Protocol (Chapel Hill, NC) designed specifically for NSF science and math education grants will be used in addition to newly developed instruments and protocols (Attachment C). The new tools will measure outcomes such as teachers' beliefs about teaching and learning; their comfort level in teaching science, and the use of inquiry-based teaching methods and resources. Baseline data on all outcomes will be established prior to program implementation to allow for the assessment of change at the end of each year of the grant. Multiple measurements of each outcome throughout the grant period will allow for accommodating small sample sizes. Both internal and external evaluators will be used in collecting and interpreting data. Internal evaluation will be conducted by COSI staff, and will focus on both content analysis of professional development and lesson plans of the participating novice teachers. External evaluation will be conducted by partners in MetriKs Amerique, who will develop the pre- and post surveys, gather and analyze all survey data and provide formative and summative evaluation reports. COSI and project partners will adhere to all evaluation standards set forth by IMLS and commit to accurate, effective reporting of all project activities.

9. Dissemination

The dissemination of results from this project will occur through a variety of formats both regionally and nationally. Informative sessions at conferences such as the Science Educators Council of Ohio (SECO) conference, the American Federation of Teachers (AFT) regional and national conferences, National Science Teachers Association (NSTA) annual conference, and the Association of Science and Technology Centers (ASTC) annual conference. Distribution of results will also be pursued through articles proposed to professional journals and newsletters such as the Informal Learning Review Newsletter, ASTC newsletter, Education Week, and AFT publications. Partner web-sites will also include progress of the ISCIS project.

10. Sustainability

Because the program is founded on the NSES research-based curriculum and professional development models, urban districts can use their Title funds to support a similar program. Local foundations such as Martha Holden Jennings and Toledo Community Foundation have

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